EXHIBIT 4
PUBLIC REDACTED VERSION

Page 1

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 1              UNITED STATES DISTRICT COURT
              NORTHERN DISTRICT OF CALIFORNIA
 2                SAN FRANCISCO DIVISION
 3
      IN RE GOOGLE PLAY STORE      :   Case No.
 4    ANTITRUST LITIGATION         :   3:21-md-02981-JD
                                   :
 5                                 :
      This Document Relates To:    :
 6                                 :
      State of Utah et al. v.      :
 7    Google LLC et al.            :
      Case No. 3:21-cv-05227-JD    :
 8                                 :
      Match Group, LLC et al. v.   :
 9    Google LLC et al.            :
      Case No. 3:22-cv-02746-JD    :
10                                 :
      Epic Games Inc. v. Google    :
11    LLC et al.                   :
      Case No. 3:20-cv-05671-JD    :
12                                 :
      In Re Google Play            :
13    Consumer Antitrust           :
      LItigation                   :
14    Case No. 3:20-cv-05761-JD    :
15
16            ** ATTORNEYS' EYES ONLY **
17              TUESDAY, APRIL 4, 2023
18
19        Video Recorded and Remote Zoom
      Deposition of HAL J. SINGER, Ph.D., taken
20    pursuant to Notice, at the law offices of
      Munger, Tolles & Olson LLP, 601 Massachusetts
21    Avenue NW, Washington, DC, commencing at
      approximately 9:11 a.m., on the above date,
22    before Rose A. Tamburri, RPR, CM, CCR, CRR,
      USCRA Speed and Accuracy Champion and Notary
23    Public.
24
25
```

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1

I N D E X

2

3   TESTIMONY OF: HAL J. SINGER, Ph.D.

4

By Mr. Raphael......................7, 423

5

By Ms. Giulianelli....................423

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E X H I B I T S

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1

2   DEPOSITION SUPPORT INDEX

3

4   DIRECTION TO WITNESS NOT TO ANSWER

5   Page   Line

6   None

7

8   REQUEST FOR PRODUCTION OF DOCUMENTS

9   Page   Line   Description

10 None

11

12

13

14

15 STIPULATIONS

16 Page   Line

17 None

18

    PREVIOUSLY MARKED EXHIBITS REFERRED TO

19

    EXHIBIT NUMBER   PAGE REFERENCED

20

    DX-1059   22

21

22

23

24

25

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1   And do you get compensated in any

2   way for the amount that Econ One bills for the

3   staff time that was spent on this matter?

4   A.   Yes.

5   Q.   And how does that work?

6   A.   So in -- in general, I keep a

7   percentage of the billings of the -- of the

8   staff who are beneath me, who are working in

9   support of me, yes.

10   Q.   And what percentage is that?

11   A.   So, in general, it's 30 percent,

12   but -- but with -- with the -- with the

13   exception of the -- of the fairly senior level

14   person, I'm keeping 20 percent.

15   Q.   Okay.

16   And so just total compensation for

17   your work in this matter, both your work

18   personally, as well as your share of the

19   staff's work, do you have any estimate of

20   that?

21   A.   I do not.

22   Q.   Do you think it's more or less than

23   $2 million?

24   A.   My personal compensation? I don't

25   think it's $2 million, no.

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1   alternatively, the overcharge can take the

2   form of a suppressed subsidy.

3   I just want to make sure -- I

4   couldn't tell if your question allowed for

5   that -- that second one.

6   Q.   Understood. I appreciate that.

7   Let's just -- let's talk about

8   the -- the overcharge side, setting aside the

9   subsidy for a moment. Okay?

10   A.   To be clear, they're both

11   overcharges, right, but -- but I -- I think

12   I'm -- I think I get your drift. But you'll

13   -- how about we'll talk about take rate side.

14   Q.   Well, you know, I'm not going to say

15   the take rate side, but I'll -- I'll get to --

16   I appreciate the clarification.

17   MS. GIULIANELLI: This could take

18   all day. Objection.

19   MR. RAPHAEL: I appreciate your

20   clarification. I will -- I'll ask questions

21   so I'm not confusing you. Okay?

22   THE WITNESS: All right. Okay.

23   BY MR. RAPHAEL:

24   Q.   So if a consumer purchased an app, a

25   subscription or an in-app purchaser from a

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```
 1   developer --

 2        A.    Um-hmm.

 3        Q.    -- and that developer would not have

 4   lowered its prices if it paid lower service

 5   fees, setting aside your subsidy model, that

 6   consumer was not overcharged as to that

 7   purchase?

 8        A.    Well, I think you're -- you're asking

 9   me to assume if there are no damages, then

10   there are no damages, and I think -- which is

11   tautological.  But -- but we -- my model and

12   my view of the world is that every developer

13   will, particularly over the long run, reduce

14   its prices in response to reduction in its

15   costs.  That's -- that's my hopefully very

16   uncontroversial view; right?

17              So I have to respectfully dis --

18   reject the assumption that's baked in that --

19   that this developer for some reason defies

20   economics, defies empiricism and pockets

21   100 percent of the take rate reduction.  I

22   think that's what you're asking me to assume.

23              But what I'll grant you is that if

24   you -- if you're willing to make those

25   uneconomic assumptions, that -- that -- that
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1   certain developers defy economics and pocket

2   100 percent of the take rate, then when you go

3   down the take rate path, you won't get to

4   damages.

5   Q.   Okay.

6   So your opinion is that all

7   developers, if they experience a service fee

8   reduction, will lower the price of their

9   product to consumers?

10   A.   I'd like to put -- give a little more

11   granularity to the hypothetical 'cause the --

12   the way that you phrased it, you could have a

13   take rate reduction for a day touching one

14   percent of your revenues, right?

15   So I just want to make sure that

16   if we can rule out, kind of, silly scenarios

17   and talk about a sustained -- in my but-for

18   world, we're talking about the advent of

19   competition, you know, Circa 2009, 2010, they

20   weren't talking about a sustained long-term

21   reduction in take rate.

22   And it is my view that every

23   developer under those circumstances, long-term

24   touching all of their revenues, felt by

25   everyone, then I do think economics would

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1   this transaction to be consummated on this

2   alternative platform, and I don't want you to

3   go there because you -- you love me; I want to

4   go -- I want you to go there because you're

5   going to be better off, too, so here's a

6   portion, right?

7   That -- that is the, kind of, the

8   natural mechanism that's going to facilitate

9   pass-through in steering -- pass-through in

10 the but-for world, but it is not necessary.

11   Q.   Just so we're clear, steering is not

12 a necessary condition to pass-through in your

13 view?

14   A.   I think I can't say it any

15 differently. It's not strictly necessary, but

16 it is certainly helpful.

17   Q.   I just want to make sure I'm clear on

18 the Logit model.

19   If there were one transaction

20 involving a dating app and 100 transactions

21 involving all apps in the dating category, you

22 calculate the pass-through rate by dividing

23 one by 100 to get one percent share; right?

24   A.   I may have missed it, but I take for

25 each developer, I calculate its share, right,

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 1   within a given year or a given time period

 2   within the category.

 3        Q.   Right.

 4        A.   That is correct, okay, but I couldn't

 5   tell that from your -- from your hypothetical.

 6        Q.   Right.

 7             So maybe I'll just cut through it

 8   and say it's true, under your Logit model for

 9   pass-through, that each developer's

10   pass-through rate is the inverse of their

11   share of their category?

12        A.   It's one minus the share.  Not quite

13   the inverse, but one minus the share of

14   their -- of their category, that's right.

15        Q.   And so the only way that an app's

16   pass-through rate would be -- would be zero is

17   if the app had a 100 percent share of its

18   category?

19        A.   Correct.

20        Q.   You calculated the service fee rate

21   that Google supposedly would have charged

22   without the challenged conduct with a

23   Rochet-Triole model and a Landes-Posner model;

24   right?

25        A.   Among others, but yes.
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1   had just been talking about our kids and

2   wives.

3   Anyway, let's -- let's keep

4   talking about dating apps.

5   MS. GIULIANELLI: Move to strike.

6   BY MR. RAPHAEL:

7   Q.   Now, you have a pass-through rate for

8   Tinder that is substantial, in the order of

9   65 percent?

10   A.   I don't have it memorized, but it is

11 what it is. It's whatever their -- their

12 share is of the category that Tinder has

13 selected to market itself, in which has a lot

14 of economic meaning.

15   Q.   So in your view, would it be wrong to

16 assume that the pass-through rate for Tinder

17 is zero percent?

18   A.   Yeah, that -- when you say, "wrong,"

19 it would -- it would violate the predictions

20 of the Logit model. I don't think that that's

21 what Tinder's pass-through rate would be in

22 the but-for world, it would not be zero.

23   Q.   So if the Match plaintiffs' expert

24 had opined that Tinder would pocket all of a

25 reduced service fee in the but-for world, it

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                                                      Page 76

 1   would be your opinion that that would be

 2   inconsistent with economics?

 3   MS. GIULIANELLI: Objection to the

 4   form.

 5   THE WITNESS: Yes, totally wrong.

 6   BY MR. RAPHAEL:

 7   Q.   Your pass-through model is based on

 8   categories of apps in the Google Play Store?

 9   A.   Correct, with one important caveat.

10   It's not just that Google gets to select the

11   categories or has selected the categories, but

12   conditional on selecting the categories, the

13   developer then selects which category they

14   want -- they want in on and they want to

15   market themselves on.

16   So I feel like you have two very

17   important pieces of economic information

18   there.

19   Q.   Okay.

20   So Google decides which categories

21   exist in the Play Store; right?

22   A.   Correct.

23   Q.   And developers then choose which

24   category they want their app to be in; right?

25   A.   Correct.

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1   going to be able to name them, but I -- I -- I

2   seem to recall a Nobel Prize maybe 15 years

3   ago for -- for applied -- an applied

4   microeconomist who was using Logit and

5   other -- other types of regressions for the --

6   the dependent variable could only take on the

7   value -- well, for certain restrictions on --

8   on the nature of the -- of the model.

9   Q.   Now, you cite in your report a

10 textbook by Kenneth Train.

11   A.   Yes.

12   Q.   Kenneth Train is an economist at the

13 University of California, Berkeley?

14   A.   That sounds right. I believe he --

15 he may have moved around, but -- but -- but

16 I -- I can take your word for it.

17   Q.   Is that a standard textbook on Logit

18 or discrete choice models?

19   A.   Yes.

20   Q.   Can you think of a more authoritative

21 source on Logit or discrete choice models than

22 the Kenneth Train textbook?

23   A.   Well, I think that any econometric

24 textbook is going to cover Logit; it's fairly

25 basic. So I think that any -- any well

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1   received or widely used econometric text that

2   covers Logit could be just as -- as valuable

3   as -- as the Train text.

4   Q.   Are there many situations in which

5   the Logit model is not appropriate?

6   A.   I don't know if I would say, "many,"

7   because we -- we see it being applied

8   routinely by economists in the antitrust

9   space, but there are certain assumptions

10   that -- that -- that are implicit lurking

11   behind Logit, just as there are assumptions

12   lurking behind every economic model.

13   Q.   And one of the -- oh --

14   A.   Can I just finish? I'm sorry.

15   Q.   Sorry. Sorry.

16   A.   -- that you would like ideally to be

17   satisfied. In certain cases, it's difficult

18   to employ the tests for whether those

19   assumptions are satisfied as -- as is the case

20   here. But -- but I -- I'll grant you that

21   there are certain restrictions about

22   preferences in the Logit, but -- but there are

23   restrictions in every -- in every economic

24   model.

25   Q.   And one of the restrictions on the

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1 Logit model is known as the independence of a

2 relevant alternative's property?

3   A.   Yes.

4   Q.   And the independence of a relevant

5 alternative's property says that all products

6 being studied in the Logit model should be

7 substitutes in proportion to their share?

8   A.   I think that's fair.

9   Q.   Okay.

10   Now, if the indepen -- indepen --

11 if the -- well, let's back up.

12   Can we call it the independence of

13 a relevant alternative's property IIA?

14   A.   Sure.

15   Q.   Okay.

16   And if the IIA assumption is not

17 satisfied in the Logit model, then the Logit

18 model can lead to unrealistic forecasts; is

19 that right?

20   A.   I'm not going to say so necessarily.

21 I think that it could produce estimates that

22 are different than the true parameters that

23 you're hoping to estimate, but I think the

24 word that you used was unreliable? And I

25 felt --

1   Q.   Well --

2   A.   -- I felt like that was too harsh.

3   Q.   Well, let me just ask you this:

4   Does your Logit model satisfy the

5 IIA property?

6   A.   I believe it does, yes.

7   Q.   And if your Logit model does not

8 satisfy IIA, would that lead you to have any

9 concern that its forecasts are unrealistic?

10   A.   Well, it would depend on -- on how

11 badly these assumptions were violated. So I

12 think that they're not. I think that the --

13 the groupings here were economically

14 reasonable. These are not my groupings; these

15 are Google's groupings that are then

16 self-selected by the -- by the apps.

17   And there are tests for IIA, I

18 think Haus -- Hausman and maybe McFadden have

19 developed a test. It's -- it has its flaws as

20 well. Those tests are not feasible here

21 because we don't have consumer level data.

22 We're -- we're just seeing the apps shares.

23 So we'd have to drop the entire app out of the

24 dataset, in which case you'd get the same

25 findings, and so you'd always affirm the IIA.

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1   Your experts, of course, didn't

2   show that IIA wasn't satisfied through those

3   tests either, which I think is confirmation

4   that we can't do those tests. But I feel

5   confident the IIA is reasonably satisfied

6   here.

7   MS. GIULIANELLI: We can -- you

8   can continue on, but at some point, let's take

9   a break. We're -- I don't want to interrupt

10 your --

11   MR. RAPHAEL: I'm happy to take a

12 break now.

13   THE WITNESS: Great.

14   THE VIDEOGRAPHER: Going off

15 record, the time is 10:37.

16   (Whereupon, a recess was taken at

17 the above time.)

18   THE VIDEOGRAPHER: Going back on

19 the record. The time is 10:47.

20 BY MR. RAPHAEL:

21   Q.   Dr. Singer, is it your opinion that

22 Google established the categories in the Play

23 Store with the IIA property in mind?

24   A.   That is doubtful. I think the record

25 evidence tells us that Google established the

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1   categories based largely on how Apple chose

2   its categories.

3   Now, it's possible that just as a

4   -- a pool player doesn't have physics in the

5   back of their mind, that they're -- they're

6   respecting the laws of physics. I think

7   that's a famous Bill Friedman quote, that when

8   Google is assembling its categories, it's

9   doing it in a way that satisfies the IIA.

10   But it certainly would be

11   astounding if -- if they had, if some

12   marketing person had the IIA at the top of the

13   mind when they were selecting the categories.

14   Q.   Right.

15   Because to your knowledge,

16   Google's decision with -- to establish the

17   categories in the Google Play Store was made

18   as a matter of marketing?

19   MS. GIULIANELLI: Objection to

20   form.

21   THE WITNESS: I think -- I think

22   that as I just stated, the record evidence

23   suggests that Google was -- ███████████████

24   ████████████████████████████████████, and

25   I think that ultimately Google wants to

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1   maximize the profits of the -- of the Play

2   Store, and so it wants consumers to be able to

3   find things easily and sensibly and it's --

4   it's profit drivenal; how about that?

5   BY MR. RAPHAEL:

6   Q.   And in trying to maximize the

7   profitability of the Play Store, Google

8   established the categories by reference to the

9   categories in the Apple App Store; is that

10   right?

11   A.   In part, yes. That Google -- that

12   Apple made presumably intelligent choices,

13   Apple's App Store was doing well and -- and

14   Google figured that ████████████████████

15   ██

16   ██

17   ████████████████████████████████████

18   ██████████████████████████.

19   Q.   Okay.

20   If the IIA assumption is not

21   satisfied, then the Logit model can lead to

22   unrealistic forecasts.

23   Do you agree with that?

24   A.   No, I think -- I think you asked me

25   that earlier, and I think that it depends on

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1   the degree to which it's not satisfied, right?

2   In any econometric model, just

3   even ordinary lease squares, we -- we -- we

4   make all sorts of demands on the nature of the

5   error terms in the model, just as we do here.

6   And there are -- there are errors, there are

7   violations and there are other violations.

8   And so I wouldn't -- I wouldn't condemn it

9   based on -- on some small violation.

10   I think -- I think that if the

11   categories were haphazardly assigned or done

12   without any kind of economic logic such that

13   consumers did not perceive, or at least some

14   consumers did not perceive the elements to be

15   substitutes, that -- that you could get

16   unreliable forecasts.

17   Q.   Okay.

18   So if consumers do not believe

19   that the products being studied in the Logit

20   model are substitutes, you can get unreliable

21   forecasts?

22   MS. GIULIANELLI: Objection to the

23   form.

24   THE WITNESS: I think that the

25   better -- the better requirement, or the more

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1   formal requirement, is that if -- if this

2   property of substitution that is at the heart

3   of Logit, which is this proportional

4   substitution, that people tend to go places

5   with higher shares, then you could get a less

6   accurate forecast than -- than -- than you

7   would hope.

8   I think that unreliable is -- is

9   fairly strong language, so I'm reluctant to go

10 that far.

11   MR. RAPHAEL: Okay.

12 BY MR. RAPHAEL:

13   Q.   And what is the standard for when IIA

14 has been violated to such a degree that you

15 think that the -- using the Logit model would

16 lead to forecasts that are inaccurate?

17   A.   So here's some things I -- I would

18 want to look for, is did the categories make

19 economic sense, all right? Is there -- is

20 there good economic basis to believe that both

21 the developers and the consumers perceived

22 those cat -- categories to define the contours

23 of competition? And I think we have that

24 here.

25   But the second thing that I'd want

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1   to look at is how well the model fits. So the

2   proof is in the pudding. If we get the wrong

3   sign, for example, on the price term, or if we

4   get an insignificant coefficient or if the

5   R-squared of the model were low, those would

6   all be indications that the IIA was violated

7   and the Logit was not, at least applied in

8   that contingency, was not a good fit.

9   But all of those -- all of those

10   things are pointing in the right direction.

11   And that's why I have confidence, so much

12   confidence in the Logit applied here.

13   Q.   All right.

14   MR. RAPHAEL: I'm going to mark

15   this as an exhibit, which is Defendants', I

16   think, 1114.

17   (Whereupon, a document was marked,

18   for identification purposes, as Exhibit

19   DX-1114.)

20   BY MR. RAPHAEL:

21   Q.   All right.

22   So Defendants' Exhibit 1114 is the

23   Logit chapter from the Kenneth Train textbook

24   that you've cited in your report.

25   A.   Okay.

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1   Q.   And I'd like you to go to page 48 of

2   the document. And you'll see at the top of

3   page 48 of the Train textbook, Professor Train

4   writes that, "Proportionate substitution can

5   be realistic for some situations, in which

6   case the logit model is appropriate. In many

7   settings, however, other patterns of

8   substitution can be expected, and imposing

9   proportionate substitution through the logit

10   model can lead to unrealistic forecasts."

11   Do you see that?

12   A.   I do see that. I don't know if we're

13   talking about the Logit pass-through model

14   here. I think this is just the Logit model in

15   econometrics generally, and so I'm not clear

16   what -- which forecast Train is speaking to.

17   I don't think that he's speaking to the

18   forecast of pass-through that I'm using.

19   Q.   Well, Dr. Singer, you relied on this

20   article in support of the Logit pass-through

21   model that you used in your report, didn't

22   you?

23   A.   That's correct, but I'm just pointing

24   out that Train's -- Train's usage of the word

25   "forecast" most likely is speaking to a

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 1    different forecast than the forecast that I'm
 2    using the Logit model for -- hold on -- for
 3    pass-through.
 4         Q.   Okay.
 5              Is it your testimony that your
 6    Logit pass-through model does not have to be
 7    consistent with general properties of Logit
 8    models?
 9         A.   I think that the IIA does have to be
10    respected, but I think that it's a very
11    particular application of Logit and a very
12    particular prediction of what a firm's
13    pass-through rate would be, and that's the
14    forecast on which I'm relying.
15         Q.   Do you disagree with what Professor
16    Train wrote on page 48 of the article that you
17    cited in support of your Logit model?
18         A.   There's nothing in here that I would
19    necessarily disagree with, but when he uses
20    the word "forecast," what I'd like to do is --
21    is study the chapter more generally to see
22    which particular forecast he has in mind and
23    whether that has anything to do with the
24    forecast that I am making.
25              For example, if -- if what he's
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1   trying to predict are, say, the -- the

2   predicted shares within a category and he

3   thinks that those forecasts could be off,

4   that's not the forecast that I'm making. So

5   it's just the word "forecast" is so general

6   that it's hard for me to -- to say that it has

7   much relevance here.

8   Q.   Do you agree that the Logit model can

9   produce seriously misleading forecasts if IIA

10   fails?

11   A.   Seriously misleading forecasts?

12   Q.   Um-hmm.

13   A.   Well, so here we're trying to predict

14   pass-through rates, and I don't think that our

15   pass-through rate forecast is going to be

16   seriously misleading for some minor infraction

17   of the IIA. And in particular, you know,

18   what's happening is that on a technical

19   matter, we're -- we're concerned about some

20   unobserved attribute being correlated with the

21   error terms. But if the groupings are done in

22   an intelligent fashion, all these error terms

23   are going to cancel. They're going to wash

24   out.

25   And so I feel like -- I feel like

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1   goodness of fit of the Logit model, and -- and

2   one of the ancillary or corollary assumptions

3   that are embedded therein is the IIA. I feel

4   like if, for a given category, we had gotten

5   the wrong sign or an insignificant coefficient

6   or a low R-squared, or we had designed the

7   categories ourselves, divorced from economic

8   reality, which we didn't, that any of those

9   outcomes would have caused me to be less

10 confident in the applicability of the Logit

11 model. But every one of those indicators were

12 pointing towards yes.

13   Q.   My question, Dr. Singer, was when you

14 conducted your regression, were you intending

15 to test whether the IIA assumption was met?

16   A.   I think I -- I don't know if my

17 answer is any different. The intention was to

18 test whether the Logit model did a good job

19 explaining the data, but implicit in that is

20 that the IIA assumption is satisfied.

21   Q.   When you conducted your regression,

22 was it your intent to test the IIA's

23 assumption in particular?

24   A.   I think that indirectly, indirectly,

25 because IIA is at the heart of Logit, when I'm

Page 101

1   testing for the goodness of fit for Logit, I'm

2   implicitly testing for whether the IIA is

3   satisfied.

4   Q.   So you were like the pool player with

5   physics; is that right?

6   A.   I don't know if I was like the pool

7   player.

8   Q.   You weren't intending to test Logit,

9   but the test that you conducted you now say is

10   a test of Logit -- of the IIA assumption?

11   MS. GIULIANELLI: Just objection

12   to the form.

13   MR. RAPHAEL: Let me -- I'll

14   strike that and ask a different question.

15   BY MR. RAPHAEL:

16   Q.   When you conducted your regression

17   with respect to the Logit model, did you have

18   the IIA assumption in mind?

19   A.   Yes.

20   Q.   Okay.

21   And was it your intent, in

22   conducting that regression, to test whether

23   the IIA assumption was met?

24   A.   I think indirectly, that was in the

25   back -- that was an intent. My -- my -- the

ATTORNEYS' EYES ONLY

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1   intent that was at the front of my mind was

2   will the Logit model do a good job or a bad

3   job at explaining substitution patterns within

4   a given category, right? And implicit in that

5   objective is whether the IIA was satisfied.

6   Q.   Did you cite any published economics

7   article in your reports to establish that it's

8   appropriate to test the IIA assumption using

9   the kind of regression that you did?

10   A.   I don't think I've cited articles in

11 my report that my test was a test of IIA. I

12 think that I feel confident that IIA was

13 satisfied by virtue of the fact that Google

14 selected the categories, the developers

15 selected in, the model fit well and then

16 finally, I tested the model under other demand

17 specifications.

18   There was quite literally nothing

19 else that I could do and there was nothing

20 that your expert did in rebutting it, zero.

21   Q.   Right.

22   A.   Nothing. Dr. Leonard did no test of

23 the IIA.

24   Q.   Right.

25   Other than the regression that you

Page 103

1   did, there was no way for you to test whether

2   the IIA assumption was met; is that right?

3   A.   No, that's not right. You're not --

4   you're not hearing what I'm saying.

5   I have confidence that the IIA was

6   satisfied because these are economically

7   sensible categories that were designed by

8   Google, that were selected into by the

9   developers. And then when we go to do the

10   actual fit, had the results come back

11   differently, had the coefficients been the

12   wrong sign, had they not been significantly

13   significant, had the R-squareds been low, and

14   then had another demand model done a better

15   job at explaining the variation of the

16   substitution patterns in the data, I would

17   have abandoned Logit.

18   Q.   Okay.

19   Other than your regression, was

20   there any test you are aware of that you could

21   have applied to determine whether the IIA

22   assumption was met?

23   A.   Yes, and I now feel like I'm

24   repeating myself. There is the

25   Hausman-McFadden test.

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 1        Q.   But you couldn't apply that here,

 2   could you?

 3        A.   Let me finish.  Let me just finish.

 4             Yeah, the Hausman-McFadden test

 5   requires you to drop all consumers from the

 6   data who selected a particular choice and then

 7   re-estimate the model and -- and compare the

 8   coefficients, right?

 9             Yes, you cannot do that here

10   because we don't have that kind of granularity

11   in the data.

12        Q.   Are you aware of any source in

13   economics that indicates that it is an

14   appropriate and reliable way to test for the

15   IIA assumption to do the kind of regression

16   that you did here?

17        A.   I don't think that that's how you'd

18   find it in a textbook.  I think that the way

19   that an econometrician would counsel you is

20   you have an assumption about how consumers

21   choose within a category; right?  If the model

22   doesn't fit well, then that would tend to

23   indicate that assumption is violated.  But it

24   starts with the -- with the goodness of fit of

25   the model itself.
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 1        Q.    Okay.
 2              Are you aware of any source in
 3   economics that indicates that it's a reliable
 4   way to test for the IIA assumption to do the
 5   kind of regression that you did?
 6        A.    Let me hear it back.  I'm sorry.
 7        Q.    Are you aware of any source in
 8   economics that indicates that doing the
 9   regression that you did is an appropriate and
10   reliable way to test for whether the IIA
11   assumption is met?
12        A.    I don't know if -- if I can point
13   you, sitting here, to an economic source for
14   that proposition, but what -- what economics
15   counsels is that to determine whether a model
16   is appropriate, you need good economic
17   foundation and you need a goodness of fit in
18   the data.
19              And then finally, what I did is I
20   tried alternative specifications.  I don't
21   think there's anything else that we can do.
22        Q.    Okay.
23              Are you aware of any source in
24   economics that goodness of fit is an
25   appropriate way to test for the IIA
```

ATTORNEYS' EYES ONLY

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1   assumption?

2   A.   No.   The way that the economics will

3   tell you is that goodness of fit will tell you

4   if the Logit is a -- is a -- is the relevant

5   way to describe preferences in substitution

6   patterns here.

7   Now, IIA is lurking in the

8   background of all of that.

9   Q.   Right.

10   But you're not aware of any source

11 in economics that goodness of fit is an

12 appropriate way to test for the IIA assumption

13 directly?

14   MS. GIULIANELLI: Objection to the

15 form.

16   THE WITNESS: I think that if you

17 go into the economic literature and you see

18 the vast application of Logit in antitrust,

19 mergers in particular, I think that for an

20 economist or an agency, or an agency's

21 economist to feel good about using Logit, what

22 they care most about is whether the categories

23 were constructed intelligently and with a good

24 grounding in economics and in -- in record

25 evidence.

ATTORNEYS' EYES ONLY

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1   doesn't do a good job here.

2   BY MR. RAPHAEL:

3   Q.   Did you consider in your reports or

4   are relying on any model of log linear demand?

5   MS. GIULIANELLI: And I'm going to

6   object to -- to the question there to the

7   extent that it calls for something not relied

8   upon.

9   THE WITNESS: It is -- it is

10   certainly possible, and I don't know this for

11   certain, but it is certainly possible that

12   when my modelers are trying out different

13   demand specifications, that they would have

14   tried out a log linear. But I -- sitting

15   here, I don't know that for a fact.

16   BY MR. RAPHAEL:

17   Q.   Do you have any view on whether log

18   linear would be an appropriate model of demand

19   for the apps and app transactions at issue in

20   this case?

21   A.   I don't have a view, but at the end

22   of the day, I'm agnostic as to what's the best

23   fit, you know. If -- if -- if -- if a -- if

24   there's another model out there that does a

25   better job at -- at explaining the data, then

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1   I -- I should consider it.

2   Q.   A log linear demand model is not

3   subject to the IIA property; right?

4   A.   It is not subject to IIA, but it

5   imposes other restrictions on the error terms,

6   right?

7   So there is no model that is, you

8   know, restriction-free. Every model that

9   you -- that you employ has certain lurking

10   assumptions about the error terms, every

11   model, right?

12   And -- and so I'll leave it at

13   that.

14   Q.   You agree that developers set their

15   prices ending in 99 cents the vast majority of

16   the time?

17   MS. GIULIANELLI: Objection to the

18   form.

19   THE WITNESS: I don't know if it's

20   the vast majority. I know that they often do,

21   but we've seen every price point in the data;

22   I've got a figure that shows every price

23   point.

24   And we should also know that 99

25   was a restriction that was imposed by Google

Page 123

1   would -- that would somehow not move, and it's

2   something below a half a percent. It's de

3   minimus.

4   Q.   Right. So let's -- let's look at

5   that. That's page 203 of your opening Merits

6   report.

7   A.   Okay.

8   Q.   And this is Table 17.

9   A.   Yes.

10   Q.   So you find there that some non-zero

11   amount of developers would not reduce their

12   prices if they were committed to having their

13   prices end in 9; isn't that right?

14   A.   Correct.

15   Q.   Do you know how many developers

16   that -- that amounts to?

17   A.   Sitting here, I don't, but it's --

18   should be easy to figure out the backup.

19   Q.   Did you run a version of this table

20   in your reports with the assumption that

21   developers would want to set prices ending in

22   99?

23   A.   I did not.

24   Q.   Okay.

25   And do you know the percentage of

ATTORNEYS' EYES ONLY

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1   What the Miller article that is

2   published peer reviewed that I'm using is

3   looking at a different experiment, which is

4   what happens when there's a systematic

5   increase in the cost of all competitors within

6   a market. Very different experiment.

7   Q.   Okay.

8   And the Miller article you cited,

9   does that refer to a per unit cost -- sorry,

10   I'll ask a different question.

11   The Miller article that you cited

12   for your Logit model, does that refer to an ad

13   valorem cost in any way?

14   A.   It refers to a perturbation in the

15   marginal cost. And the way that Miller

16   motivates the perturbation, which is a

17   frustrating word, is -- is through a per unit

18   tax.

19   Economists, when employing the

20   Logit model, often try to exploit taxes as an

21   instrument that moves a firm's costs around so

22   as to infer what the pass-through rate would

23   be.

24   Q.   Right.

25   But my question was does -- the

ATTORNEYS' EYES ONLY

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1   Miller article does not refer to a ad valorem

2   cost in any way?

3   A.   I don't think that it explicitly

4   refers, but it talks about perturbations in

5   marginal costs and the ad valorem tax that

6   Google imposes perturbs the firm's marginal

7   costs.

8   Q.   Well, changes in ad valorem costs and

9   per unit costs perturb marginal costs in

10   different ways; right?

11   A.   Oh, they could, but what the

12   derivative is going to tell you is how the

13   optimal price change is given an

14   infinitesimally small change in the firm's

15   marginal cost. And the ad valorem tax is

16   going to do that, is going to -- is going to

17   change the marginal cost, as will a per unit

18   tax.

19   Q.   But you would use different math to

20   find how a change in an ad valorem cost

21   changes the marginal cost compared to a per

22   unit change in cost; right?

23   A.   No, we can -- I don't know what you

24   mean by different costs, but we can solve to

25   the last decimal place the degree to which

ATTORNEYS' EYES ONLY

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1   Q.   Is it your opinion that your sales

2   tax regressions show that developers have

3   actually changed their pre-tax prices in

4   response to changes in sales tax rates?

5   A.   I think so, yes.

6   Q.   Okay.

7   And your regression is

8   specifically measuring whether that happened?

9   A.   Yeah. In particular, the second

10   specification, you know, the one I'm

11   remembering a parameter of .7, is telling us

12   that we see -- we see developers stepping up

13   and taking a bit of the burden of the tax,

14   this is called tax incidence in

15   microeconomics, applied microeconomics, and as

16   expected, the pain is going to be shared in

17   some way between the consumer and the

18   producer.

19   And this analysis, very

20   traditional analysis of tax incidence, is

21   telling us that the developers were willing,

22   on average, to -- to bear a portion of the

23   load.

24   Q.   Well, you say, "on average."

25   Is it -- does your analysis find

ATTORNEYS' EYES ONLY

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1   that all developers reduce prices when sales

2   tax rates changed?

3   A.   I don't know if it can go as far as

4   all, and that's a strong word. I think that

5   we're looking at our central tendencies in the

6   database.

7   Q.   Okay.

8   So it's not your opinion that your

9   sales tax regression shows that all developers

10   reduce their prices when their sales rate tax

11   changed?

12   A.   I think that would be too strong of a

13   statement. I think that their -- the data --

14   that the results could be consistent with the

15   majority, the vast majority doing so, but a

16   few not. I don't think that it can speak to

17   all, I don't think in any regression.

18   Q.   Well, do you know what percentage of

19   developers changed their prices when their

20   sales tax rate changed?

21   A.   Sitting here, I can't tell you. I

22   think that that's something that is solvable,

23   but sitting here, I can't tell you what their

24   --

25   Q.   Did you estimate that in your

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```
 1    reports?

 2        A.    I don't think so.

 3        Q.    Okay.

 4              And price stickiness didn't stop

 5    developers from changing their price when

 6    their sales tax rate changed; right?

 7        A.    Correct.  It may have impeded it to

 8    some extent, but it -- it didn't fully stop it

 9    because of the coefficients that we find.

10        Q.    And in your tax regression, the

11    independent variable is the tax rate; right,

12    the percentage?

13        A.    I think that's right, but it's

14    possible that we multiplied it by the -- the

15    value of the -- of the app, itself.  I just

16    would have to go back in the code.  But that's

17    what's driving variation for sure on the

18    right-hand side of the regression.

19        Q.    You don't know whether your

20    independent variable for the tax regression is

21    the percentage of the sales tax or the gross

22    amount?

23        A.    Sitting here, I just -- that's

24    something I can't recall, but -- but I will

25    fully acknowledge that that's what's driving
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ATTORNEYS' EYES ONLY

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1   you tried to do the derivative in your head.

2   I think that when you look at the

3   traditional models of pass-through, which,

4   remember, are a derivative of the -- if you

5   think of it as a derivative of the Lerner

6   index, it's -- it's looking at how the profit

7   maximizing price changes in response to a

8   change in cost.

9   And then you look at the most

10   common functional forms. You'll often see

11   that marginal cost drops out of the

12   pass-through equation.

13   BY MR. RAPHAEL:

14   Q.   Well, does it drop out when you're

15   looking at an ad valorem cost?

16   A.   In this case, it drops out of the

17   pass-through equation, yes.

18   Q.   Okay.

19   And can the amount of a

20   developer's marginal cost, other than the

21   service fee, affect the amount of

22   pass-through?

23   A.   Not under the Logit model that I'm

24   using. It's conceivable it could in others,

25   but in my Logit model -- not -- in the Logit

ATTORNEYS' EYES ONLY

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1   model, it's not mine, in the Logit model, it

2   tells you what portion of every dollar in

3   marginal cost reduction is going to be passed

4   through to the user.

5   And when you think about how to

6   calculate that reduction in marginal cost, it

7   doesn't turn on the other marginal costs; it

8   turns instead on the developer's price and the

9   change in the take rate.

10   Q.   Right.

11   So your Logit model that you used,

12   the estimate of pass-through damages is not

13   affected by any developer's marginal costs

14   other than the service fee?

15   MS. GIULIANELLI: Object to the

16   form.

17   THE WITNESS: I think that

18   mechanically, you don't need to know the other

19   marginal costs in order to implement the Logit

20   model, but this is an important caveat.   I

21   just want to make sure that you know that that

22   Logit model, and any other derivative of

23   the -- of -- let's call it the first order

24   condition or the profit maximizing price, all

25   takes into account the cost; that is, the

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1   costs are in the formula when you take the

2   first derivative, right?

3   You start with a profit function,

4   you take the derivative, and you get the

5   profit maximizing price. Then you take

6   another derivative of that profit maximizing

7   price with respect to a change in cost. It

8   just so happens that under the most common

9   functional demand forms, the marginal cost

10 falls out of the math.

11   So I just want to make sure the

12 record is clear. To go implement Logit, to go

13 implement Linear, you don't need to know the

14 firm's other marginal costs, but that's not to

15 say that they play no role in the pass-through

16 calculus.

17 BY MR. RAPHAEL:

18   Q.   Have you estimated in your reports

19 any developers' marginal costs other than the

20 service fee?

21   A.   No, and I feel like you asked me this

22 before. I'm confident that they have other

23 marginal costs, but I haven't estimated at the

24 developer level what their other marginal

25 costs are.

ATTORNEYS' EYES ONLY

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1   The most -- I mean, the most

2   obvious one would be processing fees. But

3   there are other marginal costs, royalty fees

4   that they pay, but -- but I haven't estimated

5   those at the developer level.

6   Q.   One of the inputs into your

7   pass-through model is Google's market share in

8   a world without the challenged conduct.

9   A.   Not in the pass-through model. Did

10   you mean to say -- it certainly -- Google's

11   market share is in Rochet-Triole and it's in

12   Landes-Posner.

13   Q.   Yes. One of your inputs into

14   calculating what Google's but-for service fee

15   would be is Google's market share in the

16   but-for world.

17   A.   Correct.

18   Q.   And you estimated that share to be 60

19   percent; right?

20   A.   I -- I used as an input the

21   60 percent because that's the best that the

22   economic literature in busting up monopolies

23   can -- can give to us.

24   I also, you know, would note --

25   yes, that is -- that is the best estimate that

ATTORNEYS' EYES ONLY

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1   I could find in the literature.

2   Q.   Okay.

3   And that market share estimate is

4   based on an article that attempted to estimate

5   AT&T's market share in the longest in its

6   telephone market in the 1980s?

7   A.   Yes, with one important caveat that

8   you left out, which was after AT&T's

9   anti-competitive tie was unwound, right?

10   What I -- what I was looking for

11   was the closest analogue in antitrust history

12   in which a dominant firm that had extended its

13   leverage from one market into another was

14   forced to unbundle or break apart the tie.

15   There aren't a lot of such episodes, right, in

16   the history of antitrust for reasons that we

17   could describe -- discuss over coffee, but we,

18   in any event, it's a network industry; it's

19   the monopoly, where the tie gets removed.

20   It's been studied ad nauseam by economists

21   for -- for the price effects that can be

22   attributable. And so I thought that

23   60 percent was the best estimate.

24   And in any event, it turns out

25   my -- my in-app model for damages is not that

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1   sensitive to the 60; that is, as you put in

2   different inputs for 60, you go to 70 or if

3   you think that Google share would have fallen

4   to 50, it just turns out that the model is not

5   that sensitive to that input.

6   Q.   Well, do you disagree that if

7   Google's but-for market share is 75 percent,

8   that your damages figure falls by over

9   40 percent?

10   A.   No, it wouldn't. It would not.

11   So you're saying if all you did --

12   see, what -- what Dr. Leonard, respectfully,

13   did was that he kept changing two parameters

14   at a time. He kept changing the but-for share

15   and the actual share. If he held everything

16   constant for Landes-Posner, if you change just

17   the but-for share, say, by 10 percentage

18   points, you get, depending on which direction

19   you go, you get something on the order of a 5

20   percentage point swing in damages.

21   And so what -- what that's telling

22   you is that the input is important, but the

23   results don't vary significantly, or let's

24   just say the results aren't amplified based on

25   the change in this input; that they're, in

ATTORNEYS' EYES ONLY

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1   being sued for -- for similar allegations of

2   the challenged conduct that's here.

3   Q.   Are you offering an opinion in this

4   case that Apple is engaged in any

5   anti-competitive conduct?

6   A.   I -- I have not offered that opinion,

7   but I can rule out putting Apple in the

8   benchmark when it is the subject of -- of

9   antitrust scrutiny for having engaged in many

10 similar strategies here and charging, you

11 know, what I believe to be a super-competitive

12 take rate in perpetuity on ancillary

13 transactions.

14   Q.   Let's talk about your Play Points

15 model for a minute.

16   A.   Okay.

17   Q.   Just so we're clear, users have to

18 opt in to Play Points?

19   A.   Yes.

20   Q.   And in the actual world, less than

21 ██████████   of Play Store users actually opted

22 in to Play Points; right?

23   A.   Right. Google is so skimpy with its

24 subsidy today that it blunts the incentives of

25 consumers to -- to opt in. There are costs to

ATTORNEYS' EYES ONLY

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1   opting in and participating in a loyalty

2   program, and if the benefits for doing so are

3   paltry, that could affect how many people take

4   advantage of the program.

5   Q.   Right.

6   There are costs to opting into a

7   rewards program; right?

8   A.   Yes.

9   Q.   Okay.

10   And in the -- in your Play Points

11   damages model, you assume that all Play Store

12   users would have signed up for the Play Points

13   program?

14   A.   No.

15   Q.   You don't?

16   A.   No, not necessarily. What I'm trying

17   to solve for is the extent of a subsidy that

18   Google would have offered across -- in the

19   aggregate across all users, but I don't think

20   that I'm necessarily assuming that each user

21   avails itself. It's possible that it would,

22   but my -- my damages model for aggregate

23   damages is looking at the savings to the class

24   if Google were to be more generous in its

25   subsidy program.

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1   Q.   Your Play Points model measures the

2   damages that consumers would have incurred in

3   the aggregate?

4   MS. GIULIANELLI: Objection to the

5   form.

6   THE WITNESS: I think that my

7   model is being offered for an estimate of

8   aggregate damages, among other things; I think

9   it also speaks to injury and impact. But I --

10 I -- I believe that that -- that -- that

11 parameter that comes out that we're interested

12 in, which is the price on the consumer side of

13 the market, is telling you across all

14 consumers, this is -- this is what -- what --

15 what Google will pay.

16 BY MR. RAPHAEL:

17   Q.   Does your Play Points model tell the

18 jury how much a user who did not sign up for

19 Play Points in the actual world was damaged?

20   A.   You could estimate, for a given

21 member of the class, you could estimate what

22 the reduction in -- in his or her net payments

23 would be relative to what they spent in the

24 actual world. And you wouldn't abandon that

25 exercise simply because they didn't use Play

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1   Points in the real world. In the real world,

2   the reason why most people or many people

3   didn't use it is because Google was so skimpy

4   with the offering.

5   In a but-for world in which Google

6   is forced through competition to employ a more

7   generous points model, including making the

8   enrollment easier, they'd -- they'd be forced

9   to. Under -- in a competitive market, it

10   would be reasonable to assume that -- that

11   most, if not all, consumers in the class

12   would -- would partake and -- and take

13   advantage of that -- of that program.

14   Q.   Are you offering the opinion that all

15   users in the but-for world would have signed

16   up for the Google Play Points program?

17   A.   Economists tend to be reluctant to

18   say all, like do I know with certainty or to a

19   reasonable certainty that every single class

20   member signs up? I don't know if the model

21   can tell us that.

22   What the model is telling us is

23   what's the -- what is the aggregate or average

24   subsidy that Google offers. And I think that

25   it is reasonable to infer that if the subsidy

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1   gets sufficiently large such that it is a

2   meaningful reward, that most, if not all,

3   consumers will take advantage of it in the

4   but-for world.

5   Q.   Have you estimated what portion of

6   users would have signed up for the Play Points

7   program in the but-for world?

8   A.   I feel like that question is no

9   different from the -- from the last.

10   I have not given an empirical

11   estimate of the proportion. I think it's very

12   high, it could be close to 100 percent, but

13   there's no requirement that it's a hundred

14   percent for the model to -- to hold.

15   Q.   If I were to come to you with a user

16   chosen at random from the data that you've

17   looked at of people that used the Google Play

18   Store, could your model tell me whether that

19   user would have signed up for the Google Play

20   Points program in the but-for world?

21   A.   I don't think the model tells you

22   whether a user will sign, but what the model

23   can tell you is what the subsidy, what the

24   predicted subsidy would be for that user. And

25   if the subsidy is as large as these models are

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1   implying, whether it's the Rochet-Triole model

2   or the Amazon model, these are big numbers;

3   we're talking about ████████ percent savings.

4   It seems like a safe inference is

5   that if a -- if Google wants to credit you

6   between ██ and ██ percent, I'm going by

7   memory, of the -- of the price of partaking in

8   all the fun of its Play Store, that most, if

9   not all, consumers will avail themselves of

10   that option.

11   Q.   Have you calculated the minimum value

12   of the Play Points subsidy that would be

13   necessary to get any consumer to sign up for

14   Play Points?

15   A.   I haven't calculated it down to the

16   decimal, but my opinion is this; that in the

17   actual world, with a -- with a paltry subsidy

18   of ███████████████, you see many people not

19   availing themselves of the option.

20   In a but-for world where the

21   subsidy is in the order of ████████ percent,

22   if we -- if Google matches Amazon, I think a

23   safe inference is that all or almost all

24   consumers will avail themselves of that

25   option.

ATTORNEYS' EYES ONLY

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1   Q.   Well, your Play Points model, though,

2 is about the percentage of the price that

3 would be credited back to consumers, not the

4 percentage of Google's revenue; right?

5   A.   Oh, no, no, no. Hold on. We're on

6 the same page, I think. It's the percentage

7 of the price from the consumer's perspective;

8 right?

9   Q.   Right.

10   A.   And so if -- if in a but-for world,

11 Google takes its subsidy from, say, ███

12 ██████ to ██████████ , right, that is a

13 material change in the terms of the program,

14 at which point you're looking at all your

15 friends who are getting ██████████ off and you

16 say hey, sign me up, I'll take some of that,

17 too.

18   Q.   Right.

19   Have you calculated the percentage

20 credit on the price that would be necessary

21 for any consumer to find it worth it to

22 overcome the cost of signing up and sign up

23 for the Play Points program?

24   A.   I haven't calculated the percentage,

25 but I will say that in a but-for world where

ATTORNEYS' EYES ONLY

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1   Google is going head-to-head with a -- with a

2   competitor who is competing on this dimension,

3   whether it's Amazon or Facebook or Samsung,

4   that Google would make sure that whatever

5   enrollment costs there were, they would not be

6   so prohibitive as to allow that rival to eat

7   their lunch.

8   Q.   Have you done any analysis of the

9   elasticity of demand for the Play Points

10 program?

11   A.   I have done elasticity of demand of

12 consumers with respect to pricing in the App

13 Store. So to the extent that Play Points or

14 any subsidy changes pricing, you could figure

15 out what the sensitivity would be.

16   Q.   But you haven't tested whether what

17 happens when Google changes its Play Points

18 subsidy and how that affects whether people

19 sign up for the Play Store -- for the Play

20 Points program; you haven't done that?

21   A.   Well, it's a bit of a trick question

22 here, because Google has been at -- at this

23 paltry ██████████, you know, since the advent

24 at least in the U.S.

25   Now, there are some experiments

Page 170

1   that you might be able to look at. In Korea

2   and Japan, I think that Google tried to meet

3   the limited competition that -- that occurred

4   there with an increase in the subsidy. But I

5   haven't studied -- I haven't studied what the

6   reaction would be.

7   I think it's safe to infer that

8   Google felt, and this is just kind of basic

9   economics, that Google felt compelled to meet

10   the competition because they feared that if

11   they didn't -- if they weren't competitive on

12   that dimension, they would lose customers.

13   Q.   Your Play Points model also uses the

14   elasticity of demand from an article about

15   AT&T long distance in the 1980s?

16   A.   That's of the rival elasticity,

17   that's right.

18   Q.   Right.

19   And that's drawn from the same

20   article as the article where you got the

21   but-for share for Google; right?

22   A.   Correct.

23   Q.   And you didn't calculate the

24   elasticity of demand in the but-for world

25   yourself?

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1   A.   Well, this is -- remember what we're

2   talking about is the rival supply elasticity.

3   So Google by the tie doesn't allow any rival

4   to enter and expand, and now you're asking me

5   where's your -- where's your model, Singer,

6   for how PayPal or Stripe, you know, would have

7   responded to an increase in Google's price.

8   They couldn't come in by virtue of the tie.

9   So I don't think that -- that

10   life, by virtue of Google's restrictions and

11   the challenged conduct here, is going to allow

12   us to test for rival supply elasticity

13   particularly in the but-for world.

14   Q.   You didn't present your Amazon Coin

15   damages model at the class certification

16   stage?

17   A.   That's correct.

18   Q.   Why not?

19   A.   I don't think that I had data at

20   that -- at that time to estimate Amazon's

21   subsidy.

22   Q.   And your Amazon Coins damages model

23   is used for calculating aggregate damages?

24   MS. GIULIANELLI: Objection to the

25   form.

                                                     Page 172

1   THE WITNESS: Correct. That --

2   that's fair, among other things. But I think

3   that the primary purpose here, now that we're

4   at the merits, is what the -- what aggregate

5   damages are.

6   BY MR. RAPHAEL:

7   Q.   And if I -- again, if I took a user

8   at random from the -- from the data on the

9   users of the Google Play Store, could your

10   Amazon Coins model tell me whether -- how much

11   in subsidy that consumer would have received?

12   A.   Yes.

13   Q.   And could it tell -- and -- and is

14   your idea that the subsidies in your Amazon

15   Coins model would have been part of a program

16   that all users would have signed up for?

17   A.   I think that once you get into the

18   ███████████████   range, I think that it would be

19   irrational and illogical for a consumer to

20   pass up that savings. They would figure out a

21   way to get enrolled.

22   Q.   Okay.

23   But you -- again, you haven't

24   studied, with respect to your Amazon Coins

25   model, the percentage of savings that would be

Page 173

1   necessary to get all users of the Google Play

2   Store to sign up?

3   A.   The model isn't going to tell us

4   that, but I think basic economics would

5   dictate that if the subsidy got that large,

6   all or almost all consumers would avail

7   themselves of the program.

8   Q.   Have you studied whether there's any

9   consumer who just finds the idea of being

10 enrolled in a loyalty program so cumbersome

11 and annoying that there's no amount of reward

12 that they would take to actually sign up?

13   A.   I don't think that that can -- can

14 happen in the but-for world because I think

15 that two things, is that the subsidy, once it

16 gets ███████████████████████, I mean, that's --

17 that becomes a real savings to the consumer;

18 and number two, Google can't throw up so many

19 frictions in its but-for loyalty program that

20 it -- it tends to impede the usage of the

21 program.

22   That -- if people thought that --

23 that it was difficult to enroll and Amazon was

24 up and running or Facebook was up and running

25 with its loyalty program and it made it

ATTORNEYS' EYES ONLY

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1   easier, I think there would be a giant, you

2   know, sucking sound as people switched over.

3   Q.   Okay.

4   And again, if a user did not sign

5   up for Google's subsidy program that you're

6   positing in your Amazon Coins model, would

7   that consumer have been any better off in the

8   but-for world under your Amazon Coins model?

9   A.   I think so, because even if you don't

10 avail yourself of the option, so long as

11 credits are accumulating, that -- that a

12 consumer could perceive that as --

13   Q.   Sorry.

14   A.   -- as a savings.

15   Q.   Let me clarify my question.

16   If a user did not sign up for the

17 subsidy program and therefore was not eligible

18 to earn any subsidies in your hypothetical for

19 your Amazon Coins model, would that consumer

20 be any better off in the world that you've

21 posited?

22   MS. GIULIANELLI: And just

23 objection to the form.

24   THE WITNESS: Yeah, what -- what

25 you're doing is you're -- you're assuming that

ATTORNEYS' EYES ONLY

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1   there's a sign-up process in the but-for

2   world, right. So I just use Starbucks points

3   this morning, which is where I start, and I

4   usually go -- I go to a different place in the

5   afternoon, but I start at Starbucks. And --

6   and I don't remember having to enroll in the

7   Starbucks program. I mean, it just was --

8   just when I got the app on my phone, I was

9   enrolled in the Starbucks app.

10   So you're -- you're -- you're

11   creating this assumption that Google is going

12   to create some frictions, and they might do

13   that now because they don't have competition.

14   But in a but-for world in which a rival is

15   attacking them with a ██████████ subsidy and

16   easy enrollment, then it would be in Google's

17   best interest to also use easy enrollment; in

18   fact, maybe even auto enrollment.

19   BY MR. RAPHAEL:

20   Q.   Okay.

21   Are there loyalty programs that

22   don't use auto enroll?

23   A.   I'm thinking about all the ones that

24   I'm enrolled in and I -- you know, I can't --

25   I don't even have -- it seems to me that when

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1 you join an airline, you're auto enrolled,

2 credit cards, auto enrolled. I don't -- I

3 don't remember filling out an application to

4 enroll in almost any loyalty program.

5   Q.   You ever go to a drugstore or a

6 grocery store and they ask you if you want to

7 sign up for the rewards card?

8   A.   Yes. CVS asked me, that's -- that's

9 true.

10   Q.   Right.

11   And so does your Play Points model

12 and Amazon Coins model assume that Google will

13 automatically enroll all users in a subsidy

14 program?

15   A.   It doesn't assume auto enrollment,

16 but -- but it does, I think, presume that if

17 competition is occurring on that dimension,

18 Google is going to make the enrollment costs

19 seamless and trivial or -- or nonexistent, in

20 which case they would use auto enrollment.

21   MS. GIULIANELLI: Happy to have

22 you continue, but at some point, let's take a

23 break just because I think --

24   MR. RAPHAEL: Sure.

25   MS. GIULIANELLI: -- it's getting

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1   to be lunch, close to lunch.

2   MR. RAPHAEL: Yeah. No problem.

3   I'm getting close to finishing

4   this topic, so maybe we just do that and we'll

5   be done and take a break.

6   BY MR. RAPHAEL:

7   Q.   Your Play Points model assumes that

8   the Play Store would have a durable incumbency

9   advantage in the but-for world?

10   A.   The Play Points model does, as do

11   many of my models, credit an incumbency

12   advantage, and -- and therefore, yeah, offers

13   what I think is a conservative estimate of

14   damages.

15   Q.   Why have you not made the same

16   assumption in your Amazon Coins model?

17   A.   The Amazon Coins model presumes that

18   Google fully matches Amazon's offer. And I

19   think that's reasonable for -- for several

20   reasons. One is that I think that Amazon

21   would pose a sufficient threat that Google

22   would have to take it seriously when they

23   actually -- actually consider having to go all

24   the way down.

25   And number two, I feel like the

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1   types of services that we're -- that we're

2   talking about here could reasonably be

3   understood as being homogenous, in which case

4   we do get -- economics would predict prices

5   that are the same between the incumbent and

6   the rivals.

7   So just long way of answering,

8   I've got one set of models that allows for an

9   incumbency advantage, in which case Google is

10 able to command a price premium vis-a-vis its

11 attackers, and I've got the Amazon model that

12 presumes that Google would not be able to

13 command a premium.

14   And I think that -- I think that

15 they're both reasonable, but I think that

16 those are the bounds around which the possible

17 damages could be.

18   Q.   Well, your Amazon Coins model

19 estimates ███████████████████   more in damages

20 than the Play Points model; right?

21   A.   Well, I don't know if it's █████

22 ████████, but I -- I will grant you that it is

23 an increase in the -- in the -- in the subsidy

24 from, and I'm going by memory, maybe

25 ████████████ under Play Points up to ████████████ .

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1   So that's what's doing the work.

2   The base of transactions are no

3   different in the two models. So ███ ████████

4   sounds like a lot, but we're actually just

5   toggling between say ██ ███████ subsidy to a

6   ██ ███████ subsidy --

7   Q.   Well --

8   A.   -- which I don't think is that --

9   that large of a range.

10   Q.   As between the Play Points model and

11   the Amazon Coins model, which do you think is

12   a more reliable model of the but-for world?

13   A.   I don't -- I don't know if I have an

14   opinion as to which one is more reliable. I

15   think they're both reliable. I think that

16   I've set the bounds now on -- on -- on what

17   damages could be. And one is certainly more

18   conservative, which is the one that -- that

19   allows Google to preserve a -- an incumbency

20   advantage.

21   So I think that it's -- I think

22   that it's fine to offer the two and -- but

23   I -- but I feel it's a bit unfair to say --

24   it's like asking me to choose between my

25   daughters. You know, these are two good

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1   models and I think they're both reasonable.

2   Q.   So you can't say whether it's more

3   reliable for the -- to estimate damages at the

4   ████████████████████   that you have for the

5   Amazon Coins model or the ████████████████

6   that you have for the Play Points model?

7   A.   No. And you keep -- you keep going

8   back to the difference in the magnitude.

9   That's just because we have such a large base

10   of spending.

11   What we're really trying to figure

12   out is as we toggle between the ████████   of

13   the Play Points and ██████████, which is about

14   ████████████████████, should we -- should we

15   credit Google with an incumbency advantage or

16   should we not.

17   I think there are legitimate

18   arguments that would suggest that if entry by

19   a rival were to occur early enough in the

20   place for experience, then it would be -- it

21   would be too charitable to Google to credit it

22   with an incumbency advantage, right? If

23   Google were facing a rival right out of the

24   gate, right, what's the source of its -- of

25   its incumbency advantage?

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1   Q.   Have you formed an opinion as to

2   which of the numerous different damages models

3   that you have is the most reliable one for the

4   jury in this case?

5   A.   I think it's -- it's hard to compare

6   models that are meant to do different things,

7   right? We've got some models that are meant

8   to -- to come up with but-for take rates and

9   pass-through in the -- in the primary market.

10 We've got a different model that's meant to

11 predict the but-for take rate in the

12 aftermarket.

13   I don't know how one would say

14 that one is better than the other. I feel

15 like these are the best that economics has to

16 offer for each of the -- each of the problems

17 that I've been given.

18   Q.   Did you consider using any other App

19 Store as a benchmark for your subsidy model

20 rather than the Amazon App Store?

21   A.   It's -- it's certainly possible I

22 considered. One -- one problem that I had,

23 for example, with the ONE Store is that the

24 ONE Store is competing along both dimensions.

25 I think they took their take rate down and

ATTORNEYS' EYES ONLY

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1   they did a more generous subsidy program. And

2   remember, in this -- when we go down this

3   branch of the tree, we're thinking about

4   competition that only occurs on one dimension;

5   namely, take rate.

6   And the second thing that -- that

7   worried me about ONE Store is that it's --

8   it's specific to Korea and Amazon was -- was

9   global. And so I felt that -- that we just

10   didn't have as good of a benchmark as Amazon

11   for -- for that parameter.

12   Q.   Okay.

13   A.   Oh, there's one more reason, too, is

14   that I don't think we have the magnitude of

15   ONE Store's subsidy. We have the dollar

16   amount, I found press articles that said it's

17   X hundreds of millions of dollars, but I --

18   I -- I wasn't able to -- to generate a -- a

19   subsidy in terms of percent of spend for ONE

20   Store.

21   Q.   Okay.

22   MS. GIULIANELLI: Pretty soon we

23   can take a break for lunch.

24   MR. RAPHAEL: Sure.

25   BY MR. RAPHAEL:

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 1        Q.    Did you -- did you analyze whether

 2   any of the benchmark App Stores in Table 7

 3   offer subsidies and whether you could use

 4   those as benchmarks?

 5        A.    I did not.

 6        Q.    Okay.

 7              Just a couple more questions and

 8   we can take a break for lunch.

 9        A.    Okay.

10        Q.    Now, users sign up for Play Points

11   and then they earn points when they make

12   purchases; right?

13        A.    Correct.

14        Q.    And Amazon Coins have to be purchased

15   separately?

16        A.    Correct.

17        Q.    Did you consider whether that

18   difference could affect whether the Amazon

19   Coins program is a proper benchmark?

20        A.    I certainly considered it, and I just

21   want to make clear that in my -- in my but-for

22   world under this model, I am not positing that

23   Google mimics Amazon's program verbatim,

24   right.  I recognize there are differences in

25   the program.
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ATTORNEYS' EYES ONLY

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 1              What -- what I'm interested in in

 2    looking at the Amazon experiment is the size

 3    of the subsidy.  These are -- these are monies

 4    that were actually redeemed by Amazon's

 5    consumers and that's the -- that's the input

 6    that my model is calling for.

 7        Q.   Did you consider whether any

 8    differences between the Amazon Coins program

 9    and the Play Points program could affect how

10    much Amazon offered as a subsidy?

11        A.    I mean, I studied the differences in

12    the program, but I can't -- I can't think of a

13    good reason sitting here, maybe you can give

14    me one, for why that difference in the program

15    would cause the subsidy to vary.  I just -- I

16    can't think of one.

17        Q.    Well, when users buy Amazon Coins

18    separately and they can't be converted back to

19    cash; right?

20              MS. GIULIANELLI:  I'm sorry, did

21    you say can or can't?  I just...

22    BY MR. RAPHAEL:

23        Q.    When users buy Amazon Coins

24    separately, they can't convert those Amazon

25    Coins back to cash; right?
```

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1   A.   I think that's right.

2   Q.   And so could the fact that once

3   consumers have purchased Amazon Coins, they're

4   stuck with them, lead Amazon to try to offer

5   significant discounts to get people to buy

6   Amazon Coins?

7   A.   I don't think so.

8   Q.   Have you analyzed that issue at all?

9   A.   No, but that -- it just doesn't sound

10 reasonable as an economic matter.

11   Q.   All right. Last line here.

12   You looked -- in your Amazon Coins

13 model, you looked at the share of consumer

14 discounts for purchases on Amazon's App Store

15 as a third-party App Store, not on Amazon

16 devices; right?

17   A.   Correct.

18   Q.   And why did you do that?

19   A.   Because I -- I felt that the best

20 competitive benchmark would be how an

21 independent App Store would price on someone

22 else's platform.

23   Q.   And you made that decision even

24 though you would agree that the vast majority

25 of Amazon's revenue from the App Store and

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```
 1   discounts were ███████████████████████████████?

 2        A.    I don't know if it's the vast

 3   majority.  I do know that Amazon is at a hard

 4   time because of challenged conduct here from

 5   getting on to Android phones, but I haven't

 6   done a decomposition of the -- of where

 7   it's -- where its App Store revenues are

 8   coming from.

 9                MR. RAPHAEL:  Okay.  Why don't we

10   take a break now.

11                THE VIDEOGRAPHER:  Going off the

12   record.  The time is 12:26.

13                (Whereupon, a luncheon recess was

14   taken at the above time.)

15                THE VIDEOGRAPHER:  Going back on

16   the record.  The time is 13:03.

17   BY MR. RAPHAEL:

18      Q.    All right.

19                Dr. Singer, let's go back to your

20   regression that you ran in connection with

21   your Logit model.

22                That regression finds a

23   correlation between the price that a developer

24   charges and the share of that developers' app

25   category?
```

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 1        A.    Close.   It's just -- yeah, the share
 2   of that developer within its category, that's
 3   right, its market share.
 4        Q.    Right.
 5              And so what the regression is
 6   looking at is if the developer changes its
 7   price, does that reduce its share of the app
 8   category; right?
 9        A.    Right.   Implying that -- that there
10   would be substitution away from that app
11   towards what consumers perceive to be
12   substitutes.
13        Q.    Right.
14              And does the regression that you
15   ran that looks at the change in price and its
16   effect on the developer's share of its
17   category tell you anything about where the
18   substitution, as you put it, comes from?
19        A.    Where it comes from is, of course,
20   the app who is raising the price.   Did you
21   mean to say where it's going?   I don't --
22   where it's coming from --
23        Q.    Ah, thank you for that.
24        A.    Okay.
25        Q.    I'll ask a better question.
```

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1   A.   Okay.

2   Q.   So your regression that you ran in

3   connection with your Logit model, does it tell

4   you where, when a developer raises its price,

5   where consumers will substitute to within the

6   category?

7   A.   This -- this particular model, or at

8   least for this purpose of a model, or this

9   stage of the model, it is simply telling you

10   that the developer loses share. But once you

11   know that the model fits and is the best

12   demand system for the data, you can infer that

13   users are moving around the category in

14   proportion to the market share of the -- of

15   the other goods.

16   Q.   Okay.

17   But the regression is one of the

18   things you used to determine the fit of the

19   model; right?

20   A.   Correct.

21   Q.   Okay.

22   And the regression, itself, does

23   not tell you when a developer raises its price

24   or lowers its price, I guess, to which apps do

25   the other -- do the consumers substitute;

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1   right? It doesn't tell you that?

2   A.   Correct.

3   Q.   Do you agree that the relevant

4   product market should include all competitive

5   constraints?

6   A.   No.

7   Q.   Is product quality --

8   A.   Can I -- also, can I just say why? I

9   mean I --

10   Q.   Sure.

11   A.   Just to be clear, you don't need to

12   include all competitive constraints because

13   there could be some very weak constraints that

14   don't prevent the exercise of market power.

15   So if the guidelines are telling

16   you to include only those that are necessary

17   in order to effectuate a price increase over

18   competitive levels, so that was the only part

19   I was pushing back on.

20   It's not all competitive

21   constraints, right? It's not every one under

22   the sun. And maybe we could define what you

23   mean by competitive. But -- but I took it to

24   mean literally any competitive including weak,

25   right? We don't need weak constraints to be